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The Journal *of* Orthopædic Surgery

DISABILITY FOLLOWING INJURIES TO THE BACK IN INDUSTRIAL ACCIDENTS

BY JAMES WARREN SEVER, M. D., OF BOSTON, MASS.

Presented at the Annual Meeting of the American Orthopaedic Association, Atlantic City, June, 1919.

This paper is presented with the idea of calling your attention to the fact that many people whose backs are injured in various ways in industrial occupations, suffer long periods of disability and incapacity from performing their usual occupations as a result of such accidents.

In looking over the records of a moderately large number of these cases one is impressed by two facts, first that the periods of disability seem unusually long in most cases, and second that the medical treatment and supervision these individuals have had has not been of the best, nor calculated to get the earliest and most adequate results, which would allow them to resume their work at the earliest opportunity.

This report covers one hundred and thirty-four cases, one hundred and twenty-four men and ten women. They have been divided into three classes as follows:

Class I. Those injured by falls of whom there are 61.

Class II. Those injured by direct blows in the back by falling objects, etc., of whom there are 31.

Class III. Those who have injured their back by lifting strains of whom there are 42.

These cases have been seen and studied individually by the writer at varying periods following the accidents and the results are presented as follows:

Class I—Injuries to the Back Due to Falls

This class comprises sixty-one cases, of whom fifty-two are men and nine women. The cause of the injury in all cases was a fall generally from a height varying from a maximum of seventy feet to a minimum of eighteen inches. These falls all resulted in back injuries of a greater or less degree, besides causing other accompanying injuries such as fracture of the arms, legs, etc. About half of these individuals were laborers, the others were divided up among factory hands, carpenters, masons, plasters, teamsters, butchers, roofers, telephone linemen, steel workers, painters, clerks, and houseworkers.

The details may be studied in Table I representing Class I.

In this class there were thirty-seven cases of contusion of the back complicated in some cases with fracture of the extremities, and a few with an accompanying or consequent hypertrophic arthritis of the spine. There were also twenty-four cases of fracture of the vertebrae. As may be noted from a study of the table, the injuries were severe, serious and consequently disabling for long periods of time, and in many cases resulted in permanent or at least partially permanent disability.

An analysis of these cases in regard to their known minimum periods of disability shows that in thirty-seven cases, leaving out the twenty-four cases of fracture of the spine, this period was 6.3 months. To include these twenty-four cases of fracture of the spine would be obviously unfair and would increase this average materially.

Taking the twenty-four spine fractures in Class I by themselves, the known minimum period of disability was 17.7 months. Class I as a whole including both groups above mentioned showed an average minimum period of disability of eleven months. The average age of this class was forty years. Here I might say that this average minimum by no means represents the actual period of real disability, either partial or permanent these individuals suffered, but only represents the time from the accident until seen by me as the impartial examiner for the Industrial Accident Board, at which time the great majority were still either partially or wholly incapacitated. Also it will be noted in the table that there is an occasional statement that there is no longer any disability existing. This is the opinion of the impartial examiner,

and is not made because the person is working, but because either from treatment or in spite of it, the examiner believes that he should try to go to work. The fact is the man has usually not gone back to work, except in occasional instances, but is still being paid compensation.

There is a peculiar mental state analogous to that so often seen in people suffering from litigation neurosis to be observed in many of these cases, which in my opinion delays their recovery.

In any fruitful discussion in regard to these accidents there should be found some reason as to why these cases, apart from the fractured spines, were incapacitated for so long a period. It is therefore my purpose to take up these thirty-seven cases, classified under contusions of the back and analyze their disability periods in terms of treatment. In order to do this, the cases were grouped as follows: Those that had what was to be considered as *adequate* treatment; those that had had *inadequate* treatment, and those that had had *no* treatment. Grouping the cases in this way it was found that the treatment was adequate in 17 cases with an average disability period of 6.8 months. Inadequate in 18 cases with an average disability period of 4.5 months. None, 2 cases with an average disability period of 17+ months.

Taking Class I as a whole the treatment was considered adequate in 25 cases, inadequate in 23, and none in 13. This shows that more than half the cases were suffering or had suffered from inadequate medical attention and is reason enough for the eleven months minimum disability resulting. A study of the cases as a whole showed that many of them were given a liniment to rub on the back; most of them were strapped once or twice at varying intervals with sticking plaster, and practically all of them were allowed to go their own sweet way, without any adequate follow-up system looking to their physical condition or proper medical attention. A number of the cases were discharged from hospitals without proper attention having been given to their backs in the way of proper support and without further advice as what was best to do or how to do it. Consequently they drifted. It is my firm belief that proper and constant medical attention in skillful hands would have cut the disability periods of these people in half.

The twenty-four cases of fractured spines represents another subdivision of Class I, and these again are cases of either perma-

nent or partially permanent disability. Only one case had the cord crushed and with a paraplegia was helpless, but lay around for twenty-two months before any treatment was suggested which would be of use to him. A number of others who had crush fractures of the vertebrae either went unrecognized and consequently untreated as such, for long periods of time, or were treated as sprained backs and strapped or furnished with a six inch belt for a supposedly sacro-iliac strain. Many crush fractures of the vertebrae left various hospitals unrecognized as such in spite of the individual's complaints, and without support for the back, in some cases as early as eleven days after the injury. Is it any wonder the disability periods are long and longer than they generally should be?

Another common condition complicating these back injuries is hypertrophic arthritis generally quiescent and pre-existent to the injury. The accident usually lights the condition up and so aggravates it. Without this complication the disability period might be short, with it the period is indefinitely lengthened and may be controlled only by careful and skillful treatment. The Industrial Accident Board is prone to recognize that an accident may and often does aggravate such a pre-existent condition and consequently the insurer has to pay compensation for the period during which the individual cannot work and has pain in the back. The presence of hypertrophic arthritis in a spine which presents a crush fracture of one or more vertebral bodies, may lead to confusion in the diagnosis in that the vertebral bodies may be so altered by the arthritic disease as to resemble a fracture and one cannot be too constantly on his guard in the interpretation of such X-ray plates.

I believe the American Orthopedic Association should go on record, or at least discuss the question of hypertrophic arthritis of the spine in relation to Industrial accidents. Can trauma cause arthritis as we see it; does it aggravate quiescent disease; what relation has its occurrence to compensation claims, etc.

It does not seem reasonable to the average individual to state that a contusion of the back without a fracture of the vertebrae would lead to a disability of probably 6.3 months. Yet it has been so in these cases. The answer I believe is lack of good medical care.

CLASS II— *See Table II*

Those injured by direct blows on the back by falling objects, etc., of whom there are thirty-one.

These cases suffered from muscle contusions as much as anything, apart from the fractures, and practically all had tender and irritable spines or backs. The injury was generally one to the soft parts. These accidents occurred to laborers, teamster, plumbers, chauffeurs, and factory workers, of whom the laborers and teamsters made up by far the greatest number, twenty-seven out of thirty-one. The average age was forty years.

A study of this series will show that the accident and injury was directly the result of their employment in most cases, and was an accepted hazard of their occupation. The types of accident were as follows: "Hit by boom of a derrick," "staging fell on him," "struck by falling timber," "caught in a trench cave-in," steam pipe fell on him," etc. In this class there were seven cases of fracture of the spine, including three crush fractures of the first lumbar vertebrae, one fracture of the cervical vertebrae, and one where the transverse processes of the lumbar vertebrae were fractured.

In Class II there are thirty men and one woman. The average age is forty years. The average time after the accident when the patient was seen by me was eight months plus, which represents the minimum period of disability. The treatment of these cases classified as before shows: Adequate three, inadequate twelve, none sixteen. Here again the cases with the exception of three fell far short of what they were entitled to in the way of treatment. In Class II there were seven cases of fracture of the spine. These fractures were the result of heavy objects falling on the patient's back. In no case was the treatment adequate; in four it was considered inadequate and three had no treatment at all. The disability periods reflect this lack of treatment very well. The average minimum period of disability in these cases inadequately treated was 14.7 months, and in those who had no treatment it was 20 months. The average period for the seven cases was 17 months which compares favorably with the fractured spines of Class I, where the period of disability was 17.7 months.

In order to give one an idea of my interpretation of the three terms, adequate, inadequate, and none or bad, I will describe the

treatment of three cases of Class II which come respectively under each one of these three groups. This will then allow the reader to judge for himself in regard to this method of classification.

1. Adequate Treatment.

This man hurt his back driving an automobile truck February 22, 1918. He was able to drive the rest of that day, but that night his back was lame. He began to have pain in the right leg on the inner side. His backache and pain still persisted, but was not severe enough to prevent him from working, and he continued to work until March 26th, driving passenger cars and doing garage work. The last three or four days that he was able to work he had severe pain in the region of the right hip. He had no medical attention up to the 26th of March, when he was told he had Sciatica. He then stayed in bed for eight weeks, with no other treatment except rest. He then was sent to the Orthopedic Department of a hospital, where X-rays were taken of his back, and a plaster jacket was applied which gave him so much discomfort that he took it off in a few hours. He was then sent to another hospital where he was put to bed on a frame, and later a jacket was applied which he wore until June 19, 1918. He was in the hospital for ten days. He has been working since June 19, 1918. His back is now stiff from fixation and he is strapped with sticking plaster. His treatment while delayed has been good on the whole.

2. Inadequate Treatment.

This man was hurt November 6, 1916, by a bag of flour falling on his back. After the accident he was taken to a hospital where his back was strapped, and he was kept in bed seventeen days. No X-rays of his back were taken. A plaster cast was then applied to his back which he wore thirty-two days. He has had no further treatment. I saw him July 30, 1917, about eight months after the accident. He has not been able to work and has a stiff painful back. An X-ray showed a crush fracture of the first lumbar vertebra. Obviously he needed support and treatment. An X-ray taken after the accident would have disclosed this condition. This man really had practically no treatment to which he was entitled.

3. Bad or None.

This man fell and had fall on top of him a lot of wet concrete on July 24, 1917. I saw him November 22, 1918, sixteen months later. He was taken home in a taxicab and called a doctor. He then went to a Jail Hospital where he stayed in bed seven months. He was there altogether ten months and twenty-four days. The only treatment he had was to have his back painted with iodine occasionally. No X-rays were taken, and when he got up he had to use two crutches. He still has a lot of pain in the back and down his leg. He needs support to the back, and would have been well long before if he had had it.

The instances shown in these three cases could be easily multiplied. It is not the general practitioner alone who is at fault. Hospitals have much to be blamed for in the careless methods of examination they allow their house officers to perpetrate and their visiting staffs to condone.

The question of treatment of these fractured spines is one of the greatest importance especially from an industrial point of view. Should they be treated as one would treat any fracture, that is, with a net minimum period of fixation, and then gradual use, or should they have a long period of fixation with plaster jackets and back braces, covering a year or two? Are we fixing them too long, or shall we be guided by clinical symptoms of a strained and irritable back, and continue fixation as long as these symptoms continue? Will increasing use begun early, say after three or four months, make a back more irritable, aggravate the callous already present, increase the symptoms, and possibly lead to nerve pressure from new callous formation, or will such use properly restricted lead to earlier restoration of usefulness and function? These are the questions we should be able to give an answer to.

Class III is represented by those cases who injured their backs by lifting strains, generally acquired by trying to carry or lift some object much too heavy for them. The diagnosis of back strain was made in the majority of the cases. The term back strain is used advisedly, for any definite classification of these cases is difficult. The majority apparently had received muscle or ligamentous tears involving the fibres of the erector spinae group of muscles, the deep spinal ligaments or the liga-

ments which are inserted about the sacrum or sacro-iliac joints. Very few showed the typical signs of a true sacro-iliac strain although it did exist in some cases but was definitely in the minority. As a rule definite back support is needed for a while, and is not supplied by a six inch canvas belt loosely applied about the pelvis.

There were 42 men in this class with an average age of forty years. The occupations were various and are indicated as follows: Laborers, bakers, carpenters, machinists, boat builders, steam fitter, janitor, iron moulder, grocery clerk, teamster, etc. All were individuals who have heavy lifting to do as a routine in their work. The average minimum period of disability was 5.9 months, which is better than either Class II with a minimum of 8+ and Class I with a minimum of 6.3 months. This is natural as the injury is generally less severe. The treatment was considered adequate in twelve, inadequate in twenty, none in ten. In all classes, 1, 2, and 3, the treatment was shown to be as follows: Adequate, forty; inadequate, fifty-five; none, thirty-nine, which shows a preponderance of ninety-four in favor of those cases which suffered prolonged periods of disability as a result of lack of medical attention and treatment.

Again to show the type of case and the methods of treatment as generally applied I will quote briefly one for each group from Class III.

GROUP A. ADEQUATE TREATMENT.

This man was hurt May 17, 1917. I saw him March 22, 1918. He strained his back lifting an iron beam. Since then he has been unable to go back to work as a carpenter on account of persistent pain in the back. After the accident he went home to bed and stayed there a week, and had his back strapped. He then went to a hospital where a plaster cast was applied, which he wore three weeks. He went to work when this was removed, but had to stop after two days on account of pain in the back. He then had a belt made for him at the hospital which he has worn ever since. He has had some massage at the hospital, but had to stop that on account of its expense. He then went to another hospital and was told to do some back exercises. He can't work now on account of pain in the back and is selling papers to make a living.

GROUP B. INADEQUATE TREATMENT.

This man strained his back October 21, 1918, attempting to lift a heavy scoop. He had to stop work and was taken to a hospital where he stayed a week, and where an X-ray was taken of his back. His back was strapped for a week. Since then he has had no treatment except some liniment which he has bought, and is taking some medicine which was given him by some friends. He is still incapacitated, a month later, and is having no treatment.

GROUP C. BAD OR NO TREATMENT.

This man hurt his back lifting a barrel May 25, 1917. I saw him August 22, 1917. He has done no work since the accident. He wore one strapping for a month, since when he has applied porous plasters. He has had practically no medical attention. His back is stiff and painful and needs support. He is still incapacitated.

It would seem as if the cases in Class III should show a much greater difference in the period of disability than either of the other classes by a marked degree, but they do not to the extent expected. What is the reason? To my mind it again comes down to lack of adequate treatment, properly and carefully carried out and followed up. Back strains are generally made light of, and strapping with sticking plaster seems to be the usual treatment. It however is apparently not enough in the way of adequate treatment or it is not properly applied so as to give good support. Strapping properly is an art, and should be done with a clear conception of what is to be accomplished mechanically, or it fails. These cases should be entitled to as good care as others with more severe injuries, and the treatment supplemented by massage, baking, etc. To my mind the first requisite is control of the patient, which it is so far obvious the free choice the patient has of physicians under the law does not supply. Either the cases must show better results from treatment, or the medical profession will fall down grievously. The Industrial Accident Board has the means of checking up each and every man practicing medicine in Massachusetts, and it behooves each individual to make good, or some readjustment in regard to the treatment of these industrial cases will have to be made. Careful and adequate physical examination will lead to more comprehensive treatment, and is an essential all too often neglected.

If this report serves only to awaken the medical profession to the dangers of new legislation likely to come because of the neglect of these industrial accidents it will have served its purpose. We have reached the stage where our work is individually being checked up and we must make good.

DISCUSSION

DR. GRIFFITHS said that he had personally suffered such an accident 9 years ago, while driving in a limousine, he was thrown up to the top of the car and bounced back again. He struck the seat very hard in coming down and intense pain was felt in the whole spine. He was 8 miles from a hospital, but drove there and went to bed. It was recognized that the 12th dorsal and first lumbar vertebrae were seriously hurt. He had the house surgeon strap him two-thirds of the way from the anterior superior spine, nearly up to the shoulders. He stayed in bed three or four weeks. When he got up he had no trouble in the legs and did not think of fracture. Then he went on a trip to some meeting and stopped to see brother John Ridlon, who said there was a fracture of the spinous process. After that the thing began to bother him very much. (It did not do to inform patients that they were injured). The speaker said he went to New York and saw Dr. Shaffer, who said there was a bad fracture, after which he commenced to feel very bad. Dr. Shaffer made a brace, which was worn for 12 months, taking it off at night. He was able to do his office work without any trouble. Any time that he did too much he felt the effect of the injury. Although these injuries to the spine might be severe, the patient could get along with a little assistance.

DR. JOHN RIDLON, of Chicago, said that they had been taught not to expect tuberculosis to develop on the site of an injury. He had seen two recent cases of industrial injury, with fracture of the bodies of the vertebrae. Fractures were not recognized and within two months tuberculosis had developed on the site of the fracture.

DR. S. C. BALDWIN, Salt Lake City, said that the early diagnosis of these cases was important. One important point was putting them up on an inclined plane with a Sayre's extension apparatus. One case at Chateau Thierry, shot all to pieces in the left shoulder and neck, with a big sinus in the neck, and when he turned his head to the right the right pupil dilated. He was put in an extension apparatus and in 5 weeks was relieved of the neck symptoms and the sinus closed. These injuries result in fracture and displacement of the articulatory surfaces of the bodies of the vertebrae. Diagnosis was a very important point.

DR. J. W. SEVER, in closing, said that early diagnosis was important, and the cases ought to see orthopedic surgeons earlier. Of 50 cases seen, only ten had an early diagnosis. In one girl there was complete paraplegia of both legs and retention of urine. She was being treated for hysteria and was cathererized for 9 weeks. Proper men should see the cases early. In rgard to inlay graft, Dr. Brackett had done many cases. If they were done early they might hasten recovery. It was a mistake to let the idea of a fractured spine become fixed on a man's mind. The psychology of these cases was a definite entity. One man went to pieces entirely when he was shown the X-ray, although he was not so much shaken by the injury. One should be careful in placing these cases before a jury. If one said fractured spine they supposed it something terrible. What Dr. Watkins said about putting the man to bed was true, if one knew there was fracture, but often one did not know.

DR. H. P. H. GALLOWAY said that this subject was of such great importance, that he would suggest that it be given a prominent place in the program next year. There were an incredible number of back cases returning from the war. In the question of pensions this would be of great importance.

THE TREATMENT OF FLAIL JOINTS OF THE UPPER LIMB FOLLOWING GUN-SHOT INJURIES.

By Harry Platt, M. S. (Lond.). F. R. C. S., (Eng.), Hon. Surgeon and Surgeon in Charge Orthopaedic Department Ancoats Hospital, Manchester, Capt. R. A. M. C. T. F., Orthopaedic Surgeon in Charge, Special Military Surgical Hospital, Grangethorpe, Manchester.

(Paper Opening a Discussion Before the British Orthopaedic Association, May 30, 1919.)

The flail joints of the upper limb following gun-shot injuries are amongst the most difficult problems in military orthopaedic surgery. In these brief introductory remarks I shall confine my attention to the shoulder and elbow joints as no case of flail wrist joint has chanced to come under my care. Furthermore the type of flail joint under consideration is the one dependent on an actual loss of bone and not that type which is secondary to a severe paralysis of muscle groups in the region of the joint. For obvious reasons this latter type of flail joint has been rarely seen in war injuries.

It is instructive to trace the actual evolution of the flail joint. The vast majority of the cases seen in the military orthopaedic hospitals are those in which a wide excision of the articular ends of the bones has been carried out in the early stages after the infliction of the wound. Such radical procedures were apparently practised as a routine measure, and as limb saving and life saving operations were undoubtedly justifiable. In this connection we cannot criticise them.

Unfortunately it is by no means rare to see flail joints, generally elbow joints, which have followed formal excisions performed for ankylosis. Such results demand criticism in no measured terms.

Although we must admit that the anatomical conditions predisposing to the development of a flail joint were provided in every case in which an extensive resection of the damaged articular ends was performed, yet it is difficult to believe that the flail joint was always inevitable. There can be little doubt that if the importance of correct postural fixation of the limb in the intermediate stages

after the subsidence of the more acute sepsis had been universally realised, many of these joints would have presented in the late stages, fair stability with a little motion or sound ankylosis in good position. I do not need to emphasise this aspect of the subject as preventive measures are now of course inapplicable to the problem under consideration.

Shoulder Joint.

Anatomical conditions. In practically all cases of flail shoulder joint, the head of the humerus has been removed entire, the line of section passing well below the tuberosities. Where the destruction of the periosteum has been small, abortive attempts at a reconstruction of the upper end of the bone are sometimes seen, manifested by the upgrowth of one or more bony spikes. In this type of case one finds that the instability of the joint is often of a degree less than that which characterises the flail joint proper.

The acromion, coracoid, and glenoid fossa are in most cases intact. The deltoid muscle rarely escapes direct involvement, atrophy, actual loss of origin, and partial or complete replacement by fibrous tissue being the rule. The recognition of the presence of an active deltoid muscle and an estimation of the degree of its future functional capacity after a period of suitable treatment, are important factors in determining the type of operation to be adopted for the disability.

II. Treatment.

Every case requires separate and special consideration particularly in regard to the functional capacity displayed by the scapular muscles and deltoid. The success of any operative procedure will depend ultimately on the development of muscular sufficiency and co-ordination. Theoretically given a deltoid capable of a moderate degree of function and with normal scapular muscles, joint stability should be possible of attainment without the production of an ankylosis, but I believe that in all cases a fixation of the shoulder joint should be aimed at. An incomplete fixation, i. e., allowing a slight degree of "give" or a small range of true motion often affords a perfectly satisfactory functional result. This is fortunate as the operative production of bony ankylosis at any rate in my own experience, has been an exceed-

ingly difficult feat. Before any operation is undertaken the usual preliminary physio-therapeutic treatment must be given. The arm should be maintained on an abduction splint and intensive training of the scapular muscles—and of the deltoid, if this is possible —must be carried out. During this period of training a certain degree of stability may develop in the joint and in one or two cases in my series actual operative fixation has been rendered unnecessary by a sufficiently prolonged period of physio-therapeutic treatment.

Furthermore I believe that any operation should be performed in two stages. In the first stage, the adherent skin scars should be exsected, the glenoid fossa and upper end of the humerus exposed and the whole block of scar tissue removed for bacteriological examination. In addition at this stage an actual reconstruction of the deltoid insertion can be effected and the result of the direct faradic stimulation of this muscle noted for future guidance. The second stage operation which as I have indicated should be designed to produce fixation may be of two types, (a) classical arthrodesis, (b) reconstruction of the head of the humerus. The traditional arthrodesis operation necessitates considerable trimming of the upper end of the humerus and therefore an additional sacrifice in a bone which is already all too short. The stump of the humerus must be brought into contact with the bared glenoid cavity and also slung up to the acromion and coracoid in some fashion. In my own experience with this operation which I adopted in the earlier cases of flail shoulder joints, bony ankylosis or even stable fibrous ankylosis was exceedingly difficult to obtain. In three cases only out of some fifteen arthrodesis operations have I obtained a stable fixed joint and in none of these was actual bony ankylosis present. It has been suggested that if an arthrodesis operation is followed by a recrudescence of sepsis, ankylosis would be more certain than if primary healing was obtained. This has not been my experience.

The operation of bone lengthening or reconstruction of the head of the humerus I have now adopted as a routine procedure in the flail shoulder joint. In an attempt to reconstruct a new head of the humerus in order to fill up the gap and to provide a fulcrum upon which the arm can be steadied by the combined action of the scapular and deltoid muscles, one hoped at first that a shoulder joint allowing actual independent motion would be produced. I

believe however that the success of this operation depends entirely upon the development of fixation of the joint—not necessarily complete—but for practical purposes a fibrous ankylosis. For this operation I adopt the following technique. A large autogenous graft is removed from the tibia shaped like a wooden mallet. The shoulder joint is exposed, the upper end of the humerus cleared and the handle of the graft driven into the medullary cavity: The wide upper end is now brought into contact with the glenoid cavity which has been completely bared as in an ordinary arthrodesis operation. In two cases to afford additional support I have used a long fascia lata sling carried through the upper end of the humerus, the upper margin of the glenoid and the acromion process. After completion of the operation the limb is put up in 90° abduction and this fixation is maintained until stability of the joint has

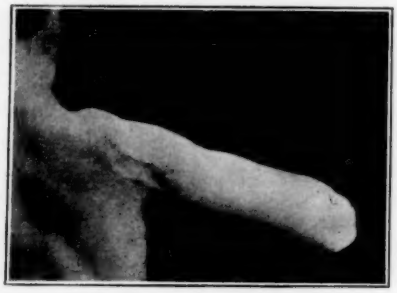

FIG. 2.—Private B.
Result of bone graft operation for flail shoulder joint. Date of operation, July 3, 1918.

FIG. 1.—Private B.
Result of bone graft operation for flail shoulder joint. Date of operation July 3, 1918.

developed. I have performed this operation in six cases, two of which have been done for a sufficiently long period to demonstrate the maintainance of the useful functional capacity which has resulted. (Fig. 1, 2 and 3.)

This operation, which is still under trial, is, I feel, well worth while.

1. ELBOW JOINT.

Anatomical conditions. In the flail elbow joint the line of section of the humerus is almost invariably well above the condyles; the olecranon is always missing, but the head of the radius in many cases has been left intact. Fusion of the upper ends of the radius

and ulna is also commonly seen in many of the elbow joints. Co-existing lesions of the median and ulnar nerves or even in some cases the musculo-spiral often complicate the problem of the disability. The stability of primary excisions of the elbow vary considerably and many cases hardly fall into the class of true flail joints. The definition of a flail elbow joint is not easy but one uses as a rough test the ability or inability of the patient to hold the forearm in the horizontal plane when the shoulder is abducted to 90°

In the true flail joint the forearm falls vertically in a limp fashion. Before any operation is performed a course of preliminary physio-therapeutic treatment is necessary in these cases. The elbow should be slung up in acute flexion and the bones approximated as closely as possible by the application of strapping. During this time training of the biceps muscle is undertaken and if the period of fixation is prolonged enough, actual shortening of the biceps will take place and become of great advantage to the future function of the limb.

FIG. 3.

X-ray of Private B. Graft in situ; nine months after operation.

FIG. 4.—Private M.

Flail elbow joint. Operation—fascia lata slinging. Date of operation, October 17, 1918.

2. TREATMENT.

The question as to whether ankylosis of the elbow joint in a good position is advisable or the retention of a movable joint with moderate stability, is one that can only be decided after a study of the anatomical conditions present and a knowledge of the past

or future occupation of the injured man. In my own experience, most of the flail elbow joints have been accompanied by serious co-existing lesions of the soft tissues and such limbs can only be made useful for very light duties. In many cases an ankylosis is the most desirable procedure but true bony ankylosis is very difficult to obtain with such small bone ends, presenting as they do an exceeding degree of atrophy. Operations devised to obtain stability with the retention of motion may be divided into two classes, (a) those in which simple approximation of the bone ends is obtained, (b) in which an increase in the length of the humerus is obtained by the insertion of a graft as in the shoulder joint operation described above. For some time I have been carrying out in picked cases an operation belonging to the first class, which consists essentially of binding the bone ends together by the insertion of one or two long stout slings taken from the fascia lata of the patient's thigh. The lower end of the humerus and the upper ends of the radius and ulna are drilled and the two artificial ligaments carried through in planes at right angles to each other, tied securely, the knots being fixed by thread sutures and then the ends of the ligaments fixed to the remains of the joint capsule and the muscle insertions in this region. The limb is slung up in 45° flexion and a period of after training of the same character as the preliminary training is carried out. Active flexion within a small range is encouraged at an early stage, the upper arm being retained in contact with the body; when stability from the position of 90° to full flexion is present, training is instituted in the position of abduction at the shoulder, the development of the stability in this position being a test of the operation. In half a dozen cases in which this operation has been carried out a useful degree of stability has developed. (Fig. 4.) I would emphasize the fact in connection with the operative stabilisation of the elbow joint that the end result depends entirely on the development of muscular control.

PERSONAL EXPERIENCE IN THE USE OF LANE PLATES

PAUL P. SWETT, M. D., F. A. C. S.

Out of a total of 1,560 fractures of the long bones observed during the past three years, there have been 172 open operations. Forty-one of these were compound fractures and 129 were for the reduction and direct fixation of simple fractures, delayed union, non-union and vicious union. Lane Plates were applied in 28 instances. So much has been heard by way of intimation with regard to the disastrous effects of the plates that it seems high time for a definite record of a series of fractures treated by means of plate fixation.

In this group of 28 fractures the distribution was as follows:

Femur: 18 instances.

Tibia and Fibula: 7 instances.

Radius and Ulna: 3 instances.

Primary healing of the operative wound was obtained in every case except on two occasions when the plates were used at the primary cleansing operation on compound fractures. I realized at the time that it is not sound surgical practice to introduce foreign materials into the wound in compound fractures but the displacement was so severe in both of these cases that I felt justified in taking the risk. However, the infection in either of these cases may have had no relation to the plates and, furthermore, excellent end results were obtained following the prompt removal of the plates.

In four cases sinuses have developed at the end of 6 to 10 weeks. In all of these instances the process was afebrile and seemed to be merely the result of foreign body irritation. The plates having accomplished the objects of their use, were promptly removed and the sinuses immediately healed in all but one case. This was a tibia and union of the bony fragments was delayed for 3 months during which time the sinus persisted. This, it seems to me, was a positive example of low grade osteomyelitis caused by the use of a plate and it is the only occurrence of its kind in the entire series. The most probable explanation of this misfortune is that the plates and screws were handled by the

operator which is entirely out of order and never necessary. Overconfidence in the method and lack of sufficient assistants account for this break in technic.

No cases of non-union, delayed union or vicious union have occurred in the entire series. During the past two years all of the patients have been advised to have the plates removed as soon as strong union of the fragments was accomplished and this with a view of preventing any late ill effects. This procedure has been carried out in four cases. It is interesting to note that no kind of abnormal soft tissue or bony reaction was found in any of these cases.

In one case of non-union of the femur operated upon 1½ years after the injury a large 6 screw plate was used and, in spite of the many protests against this particular procedure, a most excellent result occurred. The fact that excessive overlapping of the transverse fragments made it necessary to remove considerable bone, with the resultant apposition of healthy non-sclerotic fragments is the explanation of this success.

The two cases of infected compound fractures and the four cases of sinus discharge all occurred in the radius and ulna or the tibia and fibula. In other words there has never been the least trouble in any of the femur fractures which even includes one compound case. This observation has struck me very forcibly and I have concluded that the greater depth and extent of the muscle layers surrounding the femur provide a much stronger resistance than do the thin tight tissues in the leg and forearm Hence plating seems to be a much safer procedure in the femur than in other localities.

As a result of this experience I feel warranted in concluding that Lane Plates offer a highly satisfactory, safe and efficient means for securing the direct fixation of bony fragments in properly selected cases. On account of their facility of application they are particularly desirable in severely comminuted fractures where they seem mechanically more efficient than other agents and where the introduction of other fixation materials is likely to further increase the trauma.

Discussion

Dr. J. Torrance Rugh, of Philadelphia asked how the parts were held.

Dr. Rugh said the last point was one of the most important. The tissues would tolerate a certain amount of manipulation, but beyond that point they would break down. That was shown in all forms of metallic suture. Personally he was not partial to foreign substances. He placed more reliance in external fixation.

Dr. T. Halsted Myers, of New York, said he had had a case of Congenital dislocation of the hip in which an anteversion of the neck had prevented the reduction from being permanent, and he had divided the femur 2 inches below the great trochanter, rotated the lower fragment, and to make sure the leg would not re-rotate, put a plate in for three months; after this it was removed. In cases requiring an exact apposition a temporary plate was satisfactory.

Dr. Paul P. Swett said he did not hold a brief for the Lane plate, but he had had 216 fractures of the femur and in 18 cases it seemed to be the best method. He had not come to a conclusion as to whether to use more or less plates.

APPLICATION OF CURATIVE THERAPY IN THE WORKSHOP

BY EUGENE B. MUMFORD, CAPT. M. C., U. S. A., CHIEF OF ORTHOPEDIC SERVICE, BASE HOSPITAL, CAMP ZACHARY TAYLOR.

The purpose of this paper is not to discuss the actual detailed work done in the workshop. The special exercises and devices are only too familiar to you all and nothing new was developed in the clinic at the Base Hospital, Camp Zachary Taylor. It is the desire to present to you the plan of the organization of the non-operative work of the hospital and to show the apparent success of the close cooperation of the Orthopedic Department with the Educational and Physio-therapeutic Departments.

The plans of the War Department placed the reconstruction phase of the care of the crippled soldier under the supervision of the Educational Department, the officers of which are members of the Sanitary Corps and practically all of whom have had none, or little training in medicine and surgery. To them was delegated the gymnasium, manual training, and bed-side work. In turn the massage and allied clinics under the name of Physio-therapy were delegated to the Psychiatric Service. The classification of the cases falling to the Orthopedic Service has been at all times most indistinct and varied with the ideas of the individual Chief of the Surgical Service. At least such was the case at Camp Taylor.

After a survey of the character of the work found at the hospital a conference was held by the Chiefs of the Educational, Phychiatric and Orthopedic Departments and the conclusion reached that the primary purpose of the hospital was curative and that the education of the patient was at all times to be considered as of secondary importance. It was also determined that most of the peripheral nerve lesions would fall to the Orthopedic Surgeon and thus, with the other deformities resulting in loss of function, the services of the Physio-therapy Department would be used more by the Orthopedic Surgeon than by any other medical officer. As a result of this conference it was determined that though these phases of the Educational and Physio-therapy Departments would remain nominally under the Chiefs of those Services, the Orthopedic Service would be given practical control and could plan its work accordingly.

The types of cases at the hospital were the usual ones found in Base Hospitals, including all classes except amputations. Of the acute and operative phase of the work nothing shall be said. It was the chronic and non-operative, including healed post-operative cases that came to the work shop for further treatment, those cases of injury to the bones, muscles, tendons or nerves with associated loss of joint function and muscle power. It is not necessary to give a detailed clinical picture of these injuries which must be so well known to everyone.

The cases at first were scattered throughout the hospital area and found in practically all Services. Many had been in the hospital for several months, having been shifted from one ward to another and thus falling under the care of many different ward surgeons. The briefs did not show any accurate data as to the extent of the disability upon admission nor as to the changes while under treatment. As a rule only the patient could tell whether improvement had resulted and even then it was often a matter of guess. They were an uninteresting lot of cases to the average army medical officer who was holding them until time would so stabilize the lesion that they might be discharged with disability of a maximum degree.

These cases were collected into separate wards and placed under the care of an Orthopedic Surgeon. The gymnasium and the workshop, which were supervised by a trained gymnast and an expert manual training teacher, were placed under the direction of an Orthopedic Surgeon having full control of the schedule in each of these clinics. The following plan was then adopted for the handling of the crippled patient who had been classified as non-operative, or upon whom operative work would be postponed for several weeks or months.

Upon admission to the ward the usual brief was made out by the ward surgeon and the patient was sent immediately to the Orthopedic Surgeon at the workshop. Here a record card was compiled which gave the name of the patient, ward, date of admission to the Orthopedic Service, a brief description of the wound, the nature of the disability, the range of motion in the affected joints and the amount of power in weakened muscles. Notation was then made as to the treatment prescribed, as "elbow, right, flexion and extension, moderate." This card also showed the daily schedule of work of the patient.

Especial attention was given to the accurate recording of the disability. By means of special protractors the actual range of motion in the disabled joint was determined and in order to have a standard, the range of motion in the opposite and well joint was recorded in each case. The same record was made in regard to muscle power.

The patient was then given a schedule card which designated the hours of the day at which he was to report to the various clinics, this card to be kept by the patient in order that should he be picked up about the hospital area during working hours he would not have the usual excuse of "I forgot." After the Orthopedic Surgeon had finished his record the patient was then sent to the Educational Officer who enrolled him in one or more classes, noting hours upon the schedule card of the patient. Cooperation was thus maintained between the Educational and the Orthopedic Departments.

As the Physio-therapy Department was under the supervision of the Orthopaedic Surgeon all assignments to those clinics were made at the time of the first record taking. Thus the patient had four different clinics to fill up the day, Gymnasium, Workshop, Massage and Vocational or Educational. In order that the sections would be equally divided and no one overcrowded, the appointment of the hours was made by the Orthopedic Surgeon. The day was divided into two periods, the morning and the afternoon, and these were again subdivided into two equal periods. The assignment to the workshop filled an entire period of two hours as it was found possible to keep the men at work there for a much longer time than in the gymnasium. The gymnasium and the physio-therapy occupied but a subdivision, each being of an hour's duration. This arrangement left one hour in the morning and one hour in the afternoon to be occupied by the Educational work.

The keynote of the whole plan was the direct and personal supervision of all the work done in the gymnasium, workshop and massage clinics by an Orthopedic Surgeon. In the gymnasium the schedule as planned by the trained gymnast consisted of ten minutes of setting up exercises followed by twenty minutes of special work in which individual attention was given by the surgeon in seeing that the disabled part was being properly exercised. The exercises used were of the orthodox type and here as well as in the other clinics nothing new was developed. The last half hour of the

period was devoted to the playing of games. Here again some effort was made towards specialization in that the games were arranged for different types of cases, the shoulder cases playing volley ball, the wrist cases throwing hoops, etc. A shower bath with a brisk rub finished this part of the work.

In the workshop the surgeon gave the same personal supervision. The manual training feature of the work was under the direction of an expert in that line of work but all along the educational side was made secondary to the curative side. It was not so much a matter as to what the patient produced with certain tools nor how soon he finished a particular article. It was impressed upon him that a poor article made with the crippled hand would get him out of the hospital in a shorter time and with less disability than if he had made a better article with his well hand. This personal supervision of the patients during their time in the workshop is absolutely necessary in order to obtain the desired results. The patient otherwise, becomes absorbed in his work and involuntarily he will shift the tools to the well hand in order to do better and faster work. All machines, as lathes and saws, were foot or hand power, that the exercise feature of the work might always be present.

The massage and allied clinics were also given the personal supervision of an Orthopedic surgeon. The men were divided into six sections and one section was observed each day and thus each case was seen in this phase of the work each week. Theoretically the massage should be given before the patient goes to the gymnasium or workshop, but practically this is impossible when dealing with a large number of cases.

Each week the patients were remeasured and the results tabulated upon record cards. If the examination did not show any gain a survey of the case was made in order to determine whether the patient was attending the clinics regularly and if so whether or not he was working in the exercises in a conscientious way or the exercises prescribed were suitable to that particular case. If the case seemed to have reached the maximum improvement as shown by the weekly examinations the patient was ordered to appear before the Chief of the Orthopedic Staff for recommendation that he be sent before the Disability Board for discharge. This recommendation was made in the form of a progress sheet containing data of the examinations and with the note that maximum im-

provement had been reached. This sheet was taken to the ward surgeon who then prepared all other necessary papers and sent the patient before the Disability Board. This progress sheet is of great value to the Board in that it furnishes accurate data as to the course of the patient in the hospital and also gives them the exact number of degrees of motion in the affected joint and also in the corresponding well joint in the same patient.

At first the morale of the patient was not very good and it was hard to convince them that the simple exercises would be of any value. Many had been in the hospital for a long time without having had any intensive treatment while others had come from camps and hospitals with the notation that maximum improvement had been reached. A few realized that they would improve in time and were willing to go out with their existing disability. In order to have regular attendance a roll call was made at the beginning and at the end of each period. Those who were absent were ordered through the ward surgeon to report the following day at the office and unless a good excuse could be made, disciplinary measures were taken. However, this detail of the plan was soon found to be unnecessary for the patients realized that we were working not only for their improvement in function, but also for their early discharge from the army. They became interested in the results of the weekly examinations and took a personal pride in the gains that were made. The fact that they could not be discharged until they had satisfied the Orthopedic Department that maximum improvement had been reached may also have been an important factor in the regular attendance.

The facilities of the workshop were made accessible to all Departments of the hospital without the transfer of the patient to the Orthopedic Service and the same data furnished as to our own ward surgeons. In order that no case should be lost or over-looked the Orthopedic ward surgeons were instructed to call the attention of the surgeon in the shop to any cases that might seem to them to have reached maximum improvement. This is but an added check to facilitate the early discharge of the patients.

It has been interesting to note that under careful exercise some of the cases seemed to go backward and to lose in range of motion. However, by giving them a week or rest they would return to show at the first examination a greater range of motion than at any previous time. No doubt we had to deal with a muscle spasm pro-

duced by over exercise. In 185 cases of all types 149 showed a gain of 2471 degrees of motion in the joints while 36 registered a slight loss or not any gain. An average gain of 14 degrees was made in the elbow cases, 34 degrees in the shoulder, 35 degrees in the hip, 14 degrees in the ankle, 16 degrees in the knee and 18 degrees in the wrist cases. The wrist cases were most apt to show a loss. In 16 cases 370 pounds were added to the muscle power.

The basis of the workshop therapy at Camp Taylor was intensive treatment under close supervision by an Orthopedic surgeon. It has been of value not only in a curative way, but has also hastened the discharge of the patient and thus lessened his hospitalization period, saving money for the Government and returning the soldier to civil life at an earlier date. The work in the gymnasium was not only of value to the local lesion and disability but also improved the general physical condition and stimulated an interest in gymnastics which I hope the patient will carry into his home town. The same is true of the carpenter shop, the auto repair shop and the bedside work of the Reconstruction Aides. In all of these clinics the patient was taught things to make him a better and more useful citizen. And I feel sure that the psychiatrists will agree with me that many patients, by having a day full of interesting work, were saved from a life of insanity into which they were being gradually led through the incessant grind of the electric piano in the recreation centers.

Announcement

Back numbers and volumes of the American Journal of Orthopedic Surgery are now available for distribution. With the greatly aroused interest in reconstruction surgery no more valuable collection of literature can be found than this series of publications by the American Orthopedic Association. A certain number of these volumes will be offered for sale, but complete sets can no longer be had. At present, and until the supply is exhausted, any volume of the American Journal of Orthopedic Surgery from II to XIV (1903-1915) will be sent complete upon receipt of five dollars ($5.00). The volumes for 1902, 1916, 1917, 1918 cannot be had, although certain odd numbers for these years may still be obtained.

It is especially urged that members of the surgical profession who desire either for themselves or for libraries in their vicinity any comprehensive collection of Orthopedic literature should promptly subscribe for the volumes from two to fourteen or any odd numbers in this series which they do not have at present.

Promptness is suggested as the comparatively few volumes available will undoubtedly be exhausted within a short time. Odd numbers of these volumes will also be sent at $1.25 each. All copies or volumes ordered at these prices with an accompanying remittance will be sent prepaid.

Editorial

NOTES ON THE HISTORY OF ORTHOPEDIC SURGERY.

Mr. William Adams and Mr. Maunder before the Royal Medical Chirurgical Society, October 10, 1876, discussed subcutaneous division of the neck of the femur. Several cases were reported, in which the Gant operation as well as division of the neck and of the shaft below the great trochanter were employed. There were twenty-two cases in all with two deaths.

The interesting fact was mentioned that Sir Charles Bell in 1828 had proposed subcutaneous division, with a small saw, of the neck of the femur in the early stages of hip disease. It was his idea that the head of the bone would thus remain at rest in the acetabulum and a movable false joint formed at the point of osteotomy. Sir Charles Bell pointed out that such an operation would be attended by small risk. There is no record that he ever performed this operation, but it is a matter of interest that his suggestion was made three years before Stromeyer's operation of subcutaneous tenotomy.

Mr. Adams mentioned in his concluding discussion that he preferred section of the neck of the femur to the Gant operation except when the head and neck had been extensively damaged. Also in operations upon the neck there was a chance of fibrous ankylosis with a false joint. The safety of the procedure is suggested by the fact that the twenty-two cases reported with but two deaths were from the practice of twelve different surgeons.

The above remarks are based upon a report by the London Lancet of October 14, 1876.

Items of Interest to Orthopaedic Surgeons

Dr. John Allan Talbott has resumed practice, limited to Surgery of Extremities and Spinal Column (Orthopaedic Surgery), 1621 Connecticut Avenue, Washington, D. C.

Dr. Philip D. Wilson, lately consultant in charge of amputations, A. E. F., announces that he has reopened his office at 106 East Broad Street, Columbus, Ohio. Practice limited to surgery.

Dr. Lawson Thornton announces his return from active service with the army and his association with Dr. Michael Hoke in the practice of Orthopedic Surgery with offices at 15 West Alexander Street, Atlanta, Georgia.

Dr. H. J. Dauterive, who was on duty at Chateauroux and Savenay, has returned from overseas. Office 621 Macheca Building, New Orleans, Louisiana.

Dr. Maynard C. Harding desires to announce that he has returned from service and resumed his practice at Suite 701 Timken Building, San Diego, California. Orthopaedic Surgery.

INTERALLIED CONFERENCE ON WAR DISABLEMENT.—The third interallied conference for the study of problems relating to war cripples was held in Rome, Italy, October 12 to 17.

The Distinguished Service Medal has been awarded to Colonel Webb E. Cooper, Medical Corps, U. S. Army. The citation reads: "For exceptionally meritorious and distinguished services. He commanded with notable success Base Hospital No. 8 at Savenay, which under his efficient administration became the nucleus of a large hospital center, which developed into the largest classification and evacuation hospital in France for patients returning to the United States. By his marked ability in directing the numerous activities under his control he rendered services of conspicuous worth to the American Expeditionary Forces." To all those who knew Colonel Cooper at Savenay this announcement will give the greatest satisfaction.

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Current Orthopaedic Literature

GUNSHOT FRACTURES. By George E. Wilson, M. B., Toronto; *Medical Record*, Aug. 30, 1919.

The amount of damage which a missile is capable of doing depends on its weight, velocity, size and shape. Hence the difference in wounds caused by rifle and machine gun bullets, shell fragments and shrapnel. As a rule, the denser the tissue, the greater the amount of damage.

In the recent war it was soon established that if a wound were treated within a few hours of its infliction and thoroughly excised, it could be sutured with safety. It is estimated that considerably over 50 per cent of the wounds can be treated by excision and closure. Excision was done extensively in 1915, but it was not until the last year of the war that compound fractures were commonly treated by excision and primary or delayed primary suture.

The requisites for the success of this treatment are first, too much skin must not have been shot away; second, the technique must be perfect, and third, there must not be signs of well established inflammation. Excision should be done within twelve hours after the receipt of the wound, if possible. Many cases were successful after 24 hours had elapsed. The earlier the better, provided the patient is not too shocked to stand the necessary procedure.

Technique: The patient having had an immunizing dose of antitetanic serum, is anesthetized, preferably by warmed ether. The patient's clothes are removed after anesthetization so that the shock is as little as possible. The surrounding area is then thoroughly cleansed, while the wound is protected with gauze. Any foreign bodies are now removed from the wound. With fresh gloves and gown the surgeon then excises the wound using mouse-toothed forceps and a very sharp scalpel. It is important that the knife does not enter the wounded area during the dissection. All loose splinters of bone are removed. Next, all bleeding is stopped. When this cannot be done the wound is not sutured, but packed with gauze and sutured in 24 or 48 hours (delayed primary suture.) In suturing it is important to leave no dead spaces in which serum will collect. The area can be closed by catgut in layers or by silkworm-gut. Dressings and bandages are then applied and the limb is carefully splinted. Complete rest is most important. In severe wounds without fracture, splinting is also necessary.

The author then considers some of the more important gunshot fractures in detail, beginning with those of the skull.

Gunshot wounds of the spine have a higher mortality than those in any other region in the body. The symptoms are those generally met with in the fracture dislocation of civil life. In the early stage of these wounds much of the paralysis in many of the cases is due to traumatic edema and circulatory disturbances. As in the case of wounds in general, excision should be practised. The cord should not be operated on unless there are evidences of de-

pressed bone within the canal or the patient suffers very severe pain. Early operation is the best. In late operation there is danger of infection as a complication.

In gunshot wounds of the femur the fracture besides being comminuted, is generally oblique. It is important to apply a splint at the earliest possible moment to prevent shock. For transportation purposes the Thomas splint is the best. At the operation, cultures are made from various parts of the wound. In the cases of primary closure if the wound shows Streptococcus Haemolyticus, the wound should be opened and drained at once. If there is any doubt as to the sterility of a wound, delayed primary suture is resorted to. The indications for a primary amputation are : (1) Great pulverization of the bone. (2) Extensive loss of skin. (3) Rupture of the main blood vessels. (4) The establishment of virulent sepsis in extensive wounds, the patient being in a low condition. (5) Fracture complicated by extensive comminution of the condyles. (6) The presence of well established gas gangrene.

The balance of the article is devoted to a discussion of gunshot fractures involving the knee joint, hip joint, leg, foot, pelvis, upper extremity, mandible, ribs and scapula.—*Mark Cohn, New York.*

Pseudarthrosis of the Humerus Consecutive to War Wounds. By Dr. Charles Dujarier; *Medical Record*, August 23, 1919.

The author's observations are based on thirty-eight operations, in as many cases, performed by him while chief of a surgical unit in France. Thirty-six cases were due to comminuted fracture produced by projectiles. Two cases were so called closed pseudarthroses, caused by the interposition of muscular tissue between the fragments. In these two cases the interposed tissue was raised, the fragments were held in position by a screw plate, and healing was without incident. In the other cases, some showed considerable loss of bony substance with wide separation of the fragments, while in others suppuration was the predominating feature and the separation between the two fragments was slight.

Radiographs show osteoporosis of variable extent, sequestra either superficial or central, and often the projectiles. When the fragments have united, the bone again becomes opaque in proportion as it resumes its proper function.

The adjacent articulations are often stiffened. The muscles are always injured. The brachial artery was not injured in any of the cases. In none of the cases was there serious injury to the ulnar or median nerves. The radial nerve was found divided in seven cases.

The author at first used to wait one or two months after the closure of fistulae before operating; but after observing that whatever the interval, one was never sure of having postoperative asepsis, he did not consider this delay necessary. He generally drained the incisions. The good results that he obtained led him to operate in fistulous cases, and in those cases where he drained freely, obtained very pleasing results. He believes that the use of the full sized

bone graft having the purpose of restoring the humerus to its proper length is very rarely indicated. He has not used it in his cases. In several of his cases there was over 10 cm. shortening in the arm without any functional trouble. Also the possibility of fracture of the graft makes the prognosis doubtful.

Plating was used in sixteen cases, in eight of which there was union. In five there was failure or only improvement, and the remaining three cases are still under treatment. Silver wire suture was used in nine cases with seven unions, one failure and one case still under treatment. Clamps were used in two cases and union was obtained in both. Osteoperiosteal grafts after the method of Delageniere, were used in ten cases where the fragments were in apposition, without a flail-like pseudarthrosis. In these cases there were eight unions and two failures. Of the thirty-eight cases, twenty followed an aseptic course.

The radial nerve, when it has not been injured, should be avoided during the operation. In five of the cases where the nerve was wounded before operation, it was sutured. In two of these cases bony union and regeneration of the nerve was obtained.

After the operation, the limb is immobilized with the arm parallel to the body and the forearm along the anterior surface of the thorax in such a way as to leave the wound exposed, thus permitting dressing of the wound without affecting the immobilization.

Omitting the cases still under treatment, the author obtained union in 25 of 33 cases (75.7 per cent.). The time required for union was as follows: 1 month, 3 cases; 2 months, 12 cases; 3 months, 2 cases; 4 months, 3 cases; 5 months, 1 case; 7 months, 1 case; 10 months, 1 case; 11 months, 1 case; 1 year, 1 case.—*Mark Cohn, New York.*

GROWTH OF THE SURGERY OF THE FRONT IN FRANCE. By Sir Anthony Bowlby. *British Medical Journal*, August 2, 1919.

The author, who was consulting surgeon to the British armies in France throughout the course of the war, describes the development of the work of the British Medical Service from the time of the first battle of Ypres in October, 1914, to November 11, 1918. At the former date there were only three casualty clearing stations near this front, intended to be used only for evacuation. Each had seven medical officers and 200 stretchers; there were no beds. The end of 1914 found the C. C. S. with a small number of beds and nurses, and they were allowed to operate on and retain wounded men.

In 1915 there was regular operating in the C. C. S., surgical staffs were trained, accommodations for patients increased, and equipment added to. They (C. C. S.) accomplished all that was surgically necessary in times of calm, but were always overwhelmed when there was a great battle. An advanced operating center, in front of the existing C. C. S., was used for the first time at the battle of Loos in September, 1915. It and the C. C. S. were swamped by the number of cases brought in. In 1915 there were nearly 200,000 wounded, and

of these about 50,000 were wounded at Loos. At the end of 1915 the C. C. S. were real front line hospitals and the policy of providing the wounded with prompt surgical treatment was firmly established.

In 1916 front line surgery made a very great advance. In the Somme region there were 14 C. C. S., each for not less than 1,000 patients, and an advanced operating center for abdominal cases was provided. There was an increase in the staff of surgeons and nurses before heavy fighting began. As a result of the increased staff, 30,000 essential operations under anaesthesia were performed at the front during a period of three and one-half months

In 1917 the surgery everywhere was much more efficient, resuscitation wards and arrangements for badly shocked men were in every C. C. S. The Thomas splint was now being used by all the C. C. S. and field ambulances and as far front as the regimental aid posts in some areas. The methods of applying it and other first aid splints had been thoroughly taught in every field ambulance and C. C. S. on the whole front. Many new C. C. S. were provided before the battles of Vimy and Arras began and the surgeons were reinforced by teams from other units, each team composed of a surgeon, a nurse and an anaesthetist. In making arrangements for the third battle of Ypres, each C. C. S. had at least 24 medical officers. Each C. C. S. kept eight operating tables at work and 60,000 wounded were treated under anaesthetics during the fight. It was at this time that blood transfusion was first done on a large scale. Almost all the necessary operations were done at the front on this occasion.

In 1918 the medical service was fully prepared for the German attack which began on March 21st. Although some of the C. C. S. had to retire, the front line surgery continued without much interruption. The British advance which began on August 8th, and which was practically never stopped until the armistice was signed, found the C. C. S. ready in every way and ample reinforcements of surgical teams arrived in plenty of time. The lack of proper transportation facilities was a great difficulty. From August 8th to November 11th there were more than 300,000 wounded to deal with. The advances meant a constant moving of the C. C. S., and it was often necessary to send some patients to the base before operation or evacuate others sooner than surgically advisable because of the constantly recurring calls to move.

From the author's description of the growth of the work and the way in which the treatment of large numbers of wounded was adjusted to circumstances incidental to modern warfare, it can readily be appreciated that the British surgery of the front showed a continuous improvement in each successive year of the great war.—*Mark Cohn, New York.*

FRACTURES COMPLICATING THE ANKLE-JOINT. Stoner, A. P. *Journal Iowa Medical Society*, 1919, ix, 148. *Surg., Gyn. and Obst.*, Vol. XXIX, September, 1919. No. 3.

Points about Pott's fracture to bear in mind:

1. Pott's fracture is always an eversion and abduction fracture.

2. The fibula is always fractured and usually within 1½ inches of the point.

3. The tibiofibular and interosseus ligaments are always ruptured, permitting more or less separation of the lower fragments of the fibula from the tibia.

4. For proper healing in Pott's fracture the foot should be placed in the most exaggerated adducted and inverted position and maintained in this posture until healing is complete.

5. An inversion fracture is never a Pott's fracture and should be put up in the reverse position, abduction and eversion.

6. The joint should not be exercised until after a period of 8 weeks, and no weight should be borne on the foot for three or four weeks longer.—*Leo C. Donnelly, Detroit.*

THE FUTILITY OF BRIDGING NERVE DEFECTS BY MEANS OF NERVE FLAPS. By Byron Stookey, A. M., M. D., Maj., A. M. C. *Surg., Gyn. and Obst.*, Vol. XXIX, September, 1919, No. 3.

1. The repair of nerve defects by means of nerve flaps has not been definitely supported clinically, as evidenced by a critical study of the reported cases.

2. Experimentally it has been shown that nerve flaps do not serve as conducting paths for the downgrowing neuraxes.

3. Nerve flaps whether central or peripheral are merely degenerated partial nerve segments. Continuity and union of neuraxes does not take place at point of suture.

4. To avoid fallacious deductions it is important to distinguish between the level of the injury to the nerve trunk and the level at which muscular branches arise.

5. Abnormal communicating branches are not rare, particularly between the median and ulnar. Such anomalies must be taken into consideration in any careful study of nerve injuries.

6. Judging from the level of the lesions, muscles may not be presumed paralyzed but should be demonstrated paralyzed.

7. Total movements may not be offered as evidence of return of function. The action of individual muscles must be given.

8. Reports of peripheral nerve injuries, to be of value, must be accompanied by motor, sensory and electrical findings.

9. By the formation of nerve flaps from the central stump a portion of the nerve from which neuraxes must grow is removed. Distal as well as central flaps may sever muscular branches. By reversing the flaps they are taken out of their field. Thus, the downgoing neuraxes are prevented from reaching

the muscles through these muscular branches, even were regeneration to take place.

10. The nerve flap method to bridge nerve defects should be discarded in peripheral nerve surgery.—*Leo C. Donnelly, Detroit.*

DUPUYTREN'S CONTRACTURE WITH A DESCRIPTION OF A METHOD OF OPERATION. By A. Bruce Gill. *Annals of Surgery*, 1919, LXX, 221.

The treatment of Dupuytren's contracture has long been tedious and often unsuccessful. The author has employed the following method of operation: a transverse incision is made along the distal palmar crease, through which incision alone a careful dissection is made of the entire palmar fascia as far towards the base of the palm as is necessary and to the web of the fingers. Within these limits the entire fascia can be exposed, freed, and excised without injury to the underlying tendons, vessels, and nerves. The tendons are not lengthened because they are not contracted. If now the proximal interphalangeal joint cannot be easily extended, the head of the first phalanx must be excised. A small free fat transplant from the thigh is next inserted smoothly beneath the palmar skin without sutures. A well padded splint is used for a week.

Dupuytren's contracture is a contracture of the palmar fascia alone, there is thickening of the digital processes of the palmar fascia primarily, and of the main body of the fascia secondarily. Two theories are advanced as to etiology: either the contracture is due to external agencies as injuries or oft-repeated stresses to the palm, or it is constitutional in origin with palmar irritation as an exciting cause.

The advantages of an incision along a transverse crease of the palm are: the smaller scar or keloid overgrowth, and the smaller resulting contraction that would follow an incision transverse to the crease.

Unfortunately only one case is cited, and that of recent operation.—*Robert G. Packard, Denver.*

THE APPLICATION OF EXTENSION TO OVERLAPPING FRACTURES, ESPECIALLY OF THE TIBIA, BY MEANS OF BONE SCREWS AND A TURNBUCKLE, WITHOUT OPEN OPERATION. By Leonard Freeman. *Annals of Surgery*, 1919, LXX, 231.

Freeman gives his procedure in tibial fractures requiring prolonged extension, not satisfactorily obtained by ordinary means. When a weight and pulley cannot be used because of lack of sufficient skin surface, when a shoe or glued stocking impedes the circulation, and when a Steinman pin through or above the os calcis puts too much strain on the ankle joint, and since an open operation is at best not favorable, the author advises the use of the external bone clamp.

The instruments include two (or four) strong steel bone-screws, a drill of smaller diameter than the screws, a turnbuckle, and a long clamp for holding the screws in position after adjustment of the fragments. Under general anaesthesia, and after rough manual adjustment of the fragments, a small but tonhole incision is made over the tibia on either side of the fracture, the drill is insinuated through the entire diameter of the bone, the screws are then fixed, the turnbuckle placed between them close to the skin, and proper extension applied, and finally the clamp is placed upon the screws as low as practical, the turnbuckle removed and dressings applied. This apparatus may be left in place for a number of weeks, the wounds being as frequently dressed as indicated. Finally the entire apparatus may be removed without anaesthesia, and some splint applied.

The advantages of this treatment include: the large amount of force possible, very little discomfort, small amount of foreign material in the bone, facility of application and removal, absence of joint strain, and comparative freedom of patient.

Plates showing the apparatus are given, also some X-rays of fractures showing the apparatus applied.—*Robert G. Packard, Denver.*

PSEUDOARTHROSES OF THE LONG BONES FOLLOWING GUN-SHOT FRACTURE. By Glueke. *Archiv fur Orthopadische und Unfall-Chirurgie*, December, 1918, Vol. 16, No.2.

The questions of the etiology and pathology of the pseudarthroses as well as the treatments are most exhaustively discussed in this rather extensive paper and a number of X-ray pictures are furnished illustrating important points of the treatment. The X-ray does not always allow strict division between retarded callus formation and pseudarthroses except in cases where there is a gross defect in the continuity and in those showing signs of retrograde changes of the bone.

The occurrence of pseudarthroses is easily explained where both bones are destroyed for a considerable distance, directly from injury, or in those instances where too extensive a debridement has been carried out. The author very properly warns against a too radical debridement of bone, as has been the custom earlier in the war. Furthermore, excessive extension also is often responsible for the occurrence of a pseudarthrosis, as well as too early use of the affected limb. The author points out that the usually allotted time of six to eight weeks is by no means sufficient for the establishment of a solid, reliable callus. The question of systemic conditions or dycrasias does not come much into consideration in military surgery.

The locality of the fracture, however, is of great importance. Especially is this true of the long bones where the fracture occurs near the joint end. Callus production here is so inferior that it considerably interferes with consolidation.

Clinically the significance of pseudarthrosis differs very much with the bone affected. When situated in the long bones of the extremities the function is

invariably greatly interfered with, if not absolutely abolished. This is true especially of the femur, and to a lesser degree of the humerus.

In the leg and forearm pseudarthrosis in one of the bones naturally causes less severe functional disturbances. A pseudarthrosis in the lower third of the fibula may cause considerable valgus deformity; pseudarthrosis in the upper third of the radius will give little trouble; but when situated in the lower third it will interfere greatly with flexion and extension and pro and supination of the hand. From this it will appear that the significance of pseudarthrosis must be judged largely from the location and will vary naturally in different individual cases.

Treatment: The author does not consider the treatment with prostheses or splints a satisfactory one. Neither do the older, more or less conservative methods give much satisfaction. Such methods are injection of blood, the percussing and damming method, friction of the fragments, etc. The so called simple operative measures consisting in refreshing of the bone ends, are likewise unreliable.

There are only two operative methods which, the author feels, deserve consideration.

1. The direct union of the bone ends after refreshing sufficiently to eliminate all eburnated bone. This is only possible where the defect in the bone is not too great and in single bone regions, such as the humerus and femur. Fixation can then be secured by wire or better by Lane plates, for which latter the author has great regard.

In the forearm and leg the author warns explicitly of the shortening of the sound bone in order to accomplish adaptation of the affected bone. He has in several cases seen pseudarthroses develop in the sound bone following operative shortening.

A gap in the continuity of the bone should always be taken care of by bone transplants. These may be pedicled flaps, as in the method of Brandes, Moszkovicz and others, but the author prefers the free bone plasty to the pedicled flap. The periosteum should always be taken along. The intra medullary transplant is also very useful although the author has some doubt as to a sufficient amount of bone being reproduced from the bone marrow, when the latter technic is used. One of the main points is that a broad bone contact must be created between the transplant and host in order to insure vigorous callus formation.

As far as infections are concerned the success of the bone plasty greatly depends upon an aseptic course. Nevertheless, some cases show good results even in the presence of slight infections.

The experience of the author is based upon 51 operations for pseudarthroses in the long bones of the extremity of which 49 cases are considered concluded and ready for report. There was no serious complication in any of the cases and no deaths.

Operations on the lower extremities include 3 cases of pseudarthrosis of the femur; of the upper extremities, 14 cases of the humerus; and of the forearm, 34 cases, of which 16 involved the ulna, 15 the radius and in 3 cases both bones were operated.

Of the 49 cases ready for report, 8 were failures. Of these 8 cases 5 failures must be attributed to faulty technic, an avoidable factor.

In general, the author feels that the results after operation for pseudarthroses following gun-shot fracture, are very satisfactory provided the operative method is carefully selected and the proper technic prevails.—*Arthur Steindler, M. D., Iowa City, Ia.*

THE SURGICAL TREATMENT OF HALLUX VALGUS AND ITS COMPLICATIONS. By Jos. E. Fuld, M. D. *American Medicine*, August, 1919.

The surgical treatment of hallux valgus should take into consideration not only the correction of the deformity, but the preservation of the weight-bearing function of the foot and the prevention of recurrence.

Resection of the head of the first metatarsal seriously weakens the longitudinal arch and therefore impairs the weight bearing function of the foot. The author considers that this is rarely necessary. He chisels off the hypertrophied bony projection on the inner side of the head of the metatarsal with the periosteum covering it. The capsule is replaced to cover the raw surface of the bone and fixed with catgut sutures. After this comes the essential part of the operation which the author has devised to prevent recurrence of the deformity. The tendon of the Abductor Hallucis is transplanted from its insertion on the inner side of the base of the first phalanx of the great toe to the middle of the inner surface of the first phalanx and sutured with fine silk or Pagenstecher thread to the periosteum. The author gives in detail the various steps of the operation that he advocates.—*Mark Cohn, M. D., New York.*

THE WORK OF PHYSICAL RECONSTRUCTION AS IT CONCERNS ORTHOPEDIC SURGERY. By Joel E. Goldthwait, M. D., *New York Medical Journal*, September 6, 1919.

Dr. Goldthwait who was senior consultant in the division of Orthopedic Surgery of the A. E. F., gives his observations on the part played by the Orthopedic Surgeon in the treatment of casualties resulting from the war, and also on the manner in which men who were entirely unequal to the strain of full war activity were developed in special training organizations and either sent back to the combat line or placed in non-combatant work.

In treatment the Orthopedic view was kept foremost from the beginning. The important question was, "What can the man do after treatment has been completed?"

The responsibility for the supervision of the large number of casualties in which prolonged treatment was necessary was assigned in the American army to the division of Orthopedic Surgery. The closest co-operation possible existed between the orthopedic surgeon, the general surgeon, and the internist.

It was found best to bring the reconstruction work right up to the trenches, so that proper splinting of wounded parts could be done before the man was

moved. This lessened the shock of transportation and prevented laceration of tissues and other damage from bone fragments. In order to simplify the treatment, eight types of splints were selected by a special medical board. Stretcher bearers, ambulance corps men, and medical officers were drilled so that the splints were applied in the most efficient manner and with the greatest possible speed. Thus many lives were saved. In over 200,000 battle casualties in the entire A. E. F. there were less than 4,000 cases of amputation.

There was a careful standardization of the positions in which fractures of different types were to be put up and the kind of splints used. This made it possible to transport large numbers of patients with serious injuries from one hospital to another without harm.

The treatment was not only planned with reference to the perfect position of bones, but the damaged part was used as early as possible in the wards or in curative work-shops. This not only caused more rapid healing, but a more perfect functional condition as the end result.

A large number of American soldiers in France were incapable of sustained normal physical effort because of weak feet, weak backs and poorly poised bodies. With these men the problem was wholly one of training, and they were sent to special training organizations. Squad drill, bayonet drill, marching, etc., were used. The periods of work were shorter than usual and there were intervals for rest and play.

Normal posture was insisted on. In a certain number of patients with extreme degrees of flat-foot the inner edges of the heels were raised or a figure of eight ankle strap was used, with great success. Foot plates were not used in the A. E. F. Men who could be made of full combat fitness, which required in some cases three or four months, were sent back to the combat line. The others were utilized for non-combat service.

After July 1st, 1918, when combat activities increased rapidly, it was not possible to keep the men for three or four months to bring them to full military fitness. When this could be done in four or five weeks the men were returned to the combat line. The others were given short periods of training, properly shod, and given instructions that would help them so that they would have the minimum of disability and were assigned to non-combatant work.—*Mark Cohn, M. D., New York.*

SPASTIC PARALYSIS IN CHILDREN. By Jacob Grossman. *Medical Record*, September 13, 1919.

The author describes the etiology, clinical course and treatment of eight cases that have come under his observation.

One of the patients, a boy of seven years, had a syphilitic spastic paraplegia. The father had a spastic paraplegia with a 4 plus Wassermann. The mother had cerebro spinal syphilis with 4 plus Wassermann, three miscarriages, and four living children all of whom had 4 plus Wassermann. The spastic paraplegia began at the age of four years.

From his experience the following conclusions are reached by the author:

1. Spastic paralysis may result from an apparently normal delivery.

2. Infants who apparently recover may develop a spastic hemiplegia at a later period. A guarded prognosis should be given in all cases.

3. In a number of cases the only clue to a cerebral injury is the presence of stiffness, which mothers notice while bathing and dressing the children.

4. In other cases delayed function of sitting and walking direct one to the existing spastic condition.

5. Convulsions in infants either immediately or shortly after birth should make us suspect cerebral injury.

6. The possibility of syphilis as an etiologic factor should always be borne in mind.

7. Massage, electricity, supports, tenotomies, and muscle education usually offer relief and influence to a certain degree the existing condition.—*Mark Cohn, M. D., New York.*

NATIONAL ORGANIZATION OF REHABILITATION OF THE DISABLED IN ITALY. By Prof. V. Putti, Bologna, Italy. *Medical Record*, September 27, 1919.

Dr. Putti gives a detailed account of the plans and development of this work in Italy from the beginning of 1915.

At the end of physical and orthopedic treatment, the disabled man remains in the school for vocational training. Re-education is not compulsory in Italy, but the law commands that each man after having recuperated physically, pass at least fifteen days in the training school. During this period the patient is able to witness the good effect of re-education and may be won over to take a course if he has been skeptical previously.

Courses are given in shoe-making, tailoring, saddlery, carpentry, bookbinding, basket-making, cart-wright, copper trades, bookkeeping, typewriting, drawing and telegraphy. Many re-educational schools are provided with specially organized departments for agricultural training. The problem of placing the re-educated man, pensions, the assistance given the blind, tuberculous, those facially mutilated, and those whose nervous systems have been seriously impaired are also considered by the author.

Dr. Putti quotes the conclusions of Mr. Chevelley, which were arrived at after an important study of the question: 1. Whenever it is possible, the disabled man ought to be retained in the trade followed by him in the pre war days, or in one similar to it. 2. The above rule ought to be applied especially to agricultural laborers, who constitute in Italy about 85% of the total number of disabled men.—*Mark Cohn, M. D., New York.*

Open Amputation Through the Knee-Joint. By Morris K. Smith, M. D., N. Y., Capt., M. C., U. S. A. *Annals of Surgery*, Vol. LXX, Sept., 1919, No. 3.

The advantages of open amputation through the knee-joint over open amputation through the lower end of the thigh fall under three heads: (1) Less opportunity for bone and avoidance of marrow cavity infection in the stump; (2) improvement in the ultimate stump; (3) lessened operative shock.

We believe that danger and loss of time from bone infection in a stump is minimized by amputation through the knee-joint. It is evident that there is much greater risk from infection when the femur is sawn across, especially in the suppurating cases, than in amputating through the joint, which neither opens fresh bone channels nor the marrow cavity. We have found that these stumps clean up quite satisfactorily, depending on the amount of destruction of the cartilage, and the presence of osteitis in the condyles.

All the open knee-joint amputations require re-amputation. As many of the open thigh amputations require the same thing, with the alternative of an adherent terminal scar, it is not an objection. Amputation through the knee-joint conserves the maximum amount of material for creating a long, serviceable stump when the time for reamputation comes. There is a further advantage with regard to obtaining the most useful stump, namely, that in a certain proportion of such amputations through the knee, the reamputation may be in the form of an osteoplastic between the patella and femur.

Amputation through the knee-joint can be done more quickly and involves less shock than thigh amputations. Not only is there no bone to cut, but the total of soft parts is reduced to a minimum. For this reason alone, we have preferred this operation in critical cases.

Open amputation through the knee-joint, as opposed to open amputation through the lower end of the femur, offers the following advantages: fresh bone and marrow cavity are not exposed to infection; opportunity for a longer, and in some instances an osteoplastic stump; minimum operative shock.—*Leo C. Donnelly, Detroit.*

Treatment of Recent Wounds of the Knee-Joint. By Eugene H. Pool, M. D., N. Y., and John H. Jopson, M. D., Philadelphia. *Annals of Surgery*, Vol. LXX, September, 1919, No. 3.

The pessimistic views which were formerly held in regard to these lesions were due to an undervaluation of the resistance to contamination, and infection which the synovial membrane of a joint offers; and a failure to comprehend the proper operative procedures.

All wounds of joints by projectiles, except certain perforating wounds by bullets, should be operated upon.

A careful preliminary examination of the patient and his lesions is essential. The extent of involvement of the bone and the presence and position of retained foreign bodies should be established by the X-ray. The time elapsed since the wound was received, the location of the wound, the extent of injury

to the soft parts, complicating lesions of the main blood vessels and large nerves, and the general condition of the patient are factors which must be weighed before a plan of action can be decided upon.

Technic: The principles of conservative treatment may be summarized as follows: Complete debridement of the track of the projectile through the joint; absolute closure of the joint by suture; primary or delayed closure of the superficial parts according to the rules laid down for primary suture of the soft parts alone; finally, early active motion.

The incision or incisions must be placed so as to permit not only thorough debridement of the soft parts, but also free access to the foreign body and involved bone. Though no rule can be formulated, longitudinal incisions are to be preferred when practicable. Through the incisions debridement of the soft parts proceeds as in operations elsewhere.

We will consider the simplest type of case: Small perforating and penetrating wounds with little or no bone involvement. The bullet or fragment of shell has either perforated the limb, traversing the joint in its course, or has penetrated the joint and lodged there or in adjacent tissues. In some, it is difficult to determine whether the joint has been penetrated. After the capsule has been exposed, the orifice into the joint must be demonstrated before the joint is opened. Great care should be exercised to avoid opening a joint that is uninvolved. The capsule and synovial membrane should be opened by a liberal incision with thorough elliptical debridement conserving all tissues that can be left safely. Foreign bodies and loose fragments of bone must be removed. The joint is thoroughly irrigated with salt solution and then distended several times with ether. The synovial membrane and capsule are closed with fine catgut. When feasible these two layers should be sutured independently. Complete closure of the joint without drainage is the invariable rule. The soft parts overlying the capsule may be closed or left open for subsequent suture according to the same rules as are followed in wounds of the soft parts alone. In wounds of limited extent operated upon early and retained for observation a primary closure may be practiced. Otherwise the soft parts should be left open. Delayed primary suture may then be made in many cases within a week. Primary suture increases the danger of joint infection by inward extension of a superficial infection, while leaving the soft parts unsutured may delay the institution of early movements.

When the track involves an articular surface with destruction of bone and cartilage, the track must be followed and cleaned as thoroughly as possible.

In some cases, injury to the articular surface, consisting in a limited and incomplete separation of a layer of cartilage with a thin layer of underlying bone, it is advisable to remove the partly separated and poorly nourished layer of cartilage and to cleanse with chisel, gouge or currette, the surface from which it has been detached.

When a considerable area of condyle or articulating surface with a preponderance of bone is partially detached but retains good contact with the overlying soft parts, the fragment is left after the tract has been followed and the fractured surfaces have been cleansed as thoroughly as possible. If an attached fragment is to be removed this should be done if possible by the

subperiosteal method. Compound fractures of the patella should be treated by removal of completely separate fragments and preservation of large attached fragments which should be approximated if possible by suture. Complete removal of the patella should be avoided, since functional result is poor.

In extensive involvement of the articular surfaces, an effort should be made to save the joint, provided the conservable articular surfaces and soft parts are sufficient to warrant a reasonable hope of securing a useful joint. In this connection it must be borne in mind that stability is essential in the knee. When the bone lesion is so extensive as to necessitate resection through the narrow shaft above the condyles, amputation is in general preferable.

When there is such destruction of the soft parts that the edges of the capsule cannot be approximated; if an attempt is to be made to save the joint, the defect in the capsule should be completely closed with muscle or fascia. In cases where this was impossible, we have seen a partial closure made and the wound treated by the Carrel method, the aim being to close the joint subsequently by a plastic operation.

In all cases before the joint is closed complete haemostasis should be obtained. The joint is then thoroughly washed with salt solution to remove blood, bone fragments and debris. This is followed by lavage with ether under sufficient pressure to distend the joint. Closure of the joint is obligatory.

Early active mobilization is the rule. In the treatment of joints associated with fracture, mobilization of the joint is not indicated if it is likely to interfere with alignment of union or promote excessive callus formation. If the joint becomes distended, and infection is suspected, it should be aspirated immediately and a culture made.—*Leo C. Donnelly, Detroit.*

REPORT OF 82 CASES OF KNEE-JOINT WAR INJURIES FROM EVACUATION HOSPITAL 1, A. E. F., WITH REMARKS ON THE WILLEMS' TREATMENT BY IMMEDIATE CLOSURE AND SUBSEQUENT MOBILIZATION, AND THE MANAGEMENT OF THE SUBSEQUENT INFECTION BY DRAINAGE AND MOBILIZATIONS. By Clarence A. McWilliams, M. D., New York. Maj. U. S. Army, Evacuation Hospital 1, A. E. F., Associate Surgeon to the Presbyterian Hospital. *Annals of Surgery*, Vol. LXX, September 1919, No. 3, and Wm. B. Hetzel, M. D., Pittsburgh, Pa., First Lieutenant, U. S. Army, Evacuation Hospital 1, A. E. F.. Assistant Surgeon to the Allegheny General Hospital.

Nothing more startling has appeared in the outcome of this war's surgical experience than the surprising good, final, functional results obtained by Willems in his treatment of knee-joint injuries by immediate active moblization. Under Willems' treatment, patients should not be transported because the journey requires a splint which immobilizes the joint, leading to advanced periarticular oedema and to the deposition of intra-articular fibrin, both of which make more difficult subsequent mobilizing motions. Early evacuations were the rule in the American Army.

General Principles of Willems' Treatment.—Preliminary Rontgen-ray examination of the joint with the object of determining the degree of fracture, if any, also the marking out on the surface of the position of the foreign body beneath. At the operation careful debridement of all the damaged tissues surrounding the wound, external to the opening in the synovial membrane, and the removal of all the hemorrhages in the fascial planes about the wound. Changing the instruments, or re-sterilization before entering the joint. Removal of the coninstruments, or re-sterilization before entering the joint. Removal of the contused edges of the synovial wound with its enlargement up and down sufficiently to do the necessary subsequent work. The joint should be kept open just as short a time as possible in order that the synovial membrane may dry as little as possible, since a dry synovial membrane seems to predispose to ankylosis. Removal of the foreign body, all clothing and loose detached bone fragments. Smoothing off of all rough bone edges. If the foreign body is buried in the bone, it is chiselled away, following the tract to its end and removing all the devitalized bone surrounding the tract. If possible, all the procedures should be performed without the gloved hands being introduced into the joint, or without touching any contacting parts of the instruments to be introduced. At this stage, one will determine whether there is sufficient undamaged articular cartilage left to make possible the hope of subsequent restoration of function by immediate, post-operative, mobilizing movements. The joint is then thoroughly washed out with any bland unirritating solution, such as Dakin's, or normal salt solution; followed by a flushing with pure ether, then the capsular opening edges are completely closed with a plain continuous catgut suture either through and through or so passed that no suture appears inside the joint. Unless the effusion into the joint is frank pus, as in neglected cases, the synovial membrane is completely closed, disregarding the length of time that the injury has existed prior to the operation. The tissues external to the closed capsular wound had better not be closed if the injury has existed over twelve hours. The external open wound may be loosely packed with gauze, wet in Dakin's solution, or Carrel's tubes may be placed in position in the wound for subsequent treatment with Dakin's solution. The important point to emphasize is that the entry in the synovial membrane must be completely closed.

A bandage is so loosely passed about the dressing as not to impede subsequent movements.

At the time the joint is open, a culture is taken of its contents to subsequently determine the presence or absence of haemolytic streptococci which, when found, requires speedy drainage of the joint. No splint should be applied, and this is of great importance.

After Treatment.—Just as soon as the patient is out of the anaesthetic he is made to actively (never passively) move the articulation in bed. Passive motions are painful and set up an inflammatory reaction, and later may cause an extra-articular abscess to rupture into the joint. The patient's hands grasp the sides of the thigh, which is lifted from the bed by muscular contractions, his heel remaining at rest on the mattress. At first there is excessive fear of trying these motions but as the pain is felt to be very slight courage is soon established. The sooner motions are begun after the operation the less is the

pain, because the peri-articular structures do not have time to become infiltrated with exudate. The nurse sees that this is done every two hours night and day, to the greatest extent possible short of actual pain. To the faithfulness of the nurse in following these instructions will be due the subsequent restoration of function. There is astonishingly little pain when active motions are started immediately after the operation providing no bony fragments are displaced, in which case movements are not indicated. Patients say that if painful sensations appear during repose, the best way to make them disappear is to repeat the movements.

There will frequently occur, after the operation, a hemorrhagic effusion into the joint, upon the appearance of which motions become to a greater or less degree impossible, depending upon the amount of fluid present. This should be at once aspirated, to be followed immediately by the resumption of the active motions which become possible as soon as the joint is emptied of fluid. It may be necessary to aspirate the joint a number of times, a bacteriological test being made each time to determine the presence or absence of infection.

The patient on the second or third day is made to get out of bed and take a few steps without crutches. It is astonishing how little pain is experienced on walking, if active motions have been begun immediately after the operation, and how soon almost perfect function is restored.

Management of Septic Knee-Joints from War Injuries.—As soon as frank pus is evident, either by sign of inflammation or bacteriological examination, thorough drainage must be at once established by vertical external and internal incisions. The joint is washed out thoroughly with Dakin's solution at the time of the operation. Tubes should preferably not be used at first but may be later if drainage is found to be insufficient. When they are used, the internal ends should project just inside the synovial membrane and no further. The after treatment is conducted exactly as in the case of noninfected joints by active (not passive) motions carried to the point of pain. These are begun immediately after the anaesthetic has worn off and are repeated every two hours thereafter, day and night. Even a day's delay will prejudice the final functional results. Walking is important because the muscular contractions compress the joint and cause a marked increase in the expulsion of pus. The patient is made to walk the next day after the operation without crutches. It is surprising how much pus will exude from the incisions after each walk. It is very important that sufficient drainage openings be made to allow for an adequate escape of pus. These openings should be sutured joint as soon as the discharge becomes serious. If the active motions are performed often enough and vigorously enough, these secretions are expelled through the drainage openings as they are formed. Drainage seems to be more thoroughly accomplished by this method than by any other, thus limiting the infection to the synovial membrane and tending to prevent its spread to the cartilage and bones.

In civil injuries the results of operations with debridement, joint closure and immediate subsequent mobilization should be much better than in war injuries, because ordinarily the patient is operated upon more quickly, the infection is not so virulent, there is no transfer to another hospital, and the after-nursing should be more effectually done.

The following are the divisions of joint lesions by projectiles as made by Willems.

1. Simple traumatic hydrarthrosis or haemarthrosis without penetration of the joint cavity. This requires immediate aspiration with no subsequent splinting. We do not ordinarily aspirate these joints early enough or often enough. Active motions of flexion and extension with walking on the knees at once should be instituted. This is a radical departure from the old fashioned immobilization, and it is quickly very successful. That the abolition of movements is due simply to the presence of the fluid is shown by the fact that movements are possible immediately following the emptying of the joint.

2. Joint Wounds Without Injury to the Bone.—The treatment for this is outlined above in the previous part of this paper. Sometimes, while active motions are going along well, there will be a sudden functional impotence. Examination will show an effusion into the joint. This must be aspirated at once and a culture taken. Upon removal of the fluid active movements and walking should be made as before the aspiration. The aspirations may have to be repeated several times.

3. Articular Wounds with Small Bony Lesions.—Among these are the perforations of the epiphysis, erosions of the cartilage, the raising up of bone fragments from the surface and losses of deeper fragments but which are superficially small in extent. All these lesions have this in common that they leave intact the greatest part of articular surface, and there is no great fragment detached or detachable, consequently there can be no displacement by motions. The post operative treatment is exactly like that of articular wounds without bone injury.

4. Articular Wounds with Bony Lesions of Medium Severity.—By these are meant those wounds in which an important fragment of an epiphysis is detached. These are the oblique transcondylar fractures. The danger in them is the dislocation of the articular line. Active immediate mobilization should be begun at once, but in the knee, walking should be interdicted for about three weeks in order that sufficient consolidation should take place to prevent displacement of the fragment. In fractures of the patella, Willems encircles the fragments with a buried silkworm-gut suture and treats them afterwards with active motions and immediate gentle walking. His results are excellent.

5. Articular Wounds with Large Bony Fragments.—When the fracture is one of the varieties of theT-fracture, the limb must be submitted to continuous extension, mobilizations being delayed for consolidation in order to preserve the articular line.

In conclusion the authors desire to quote Dr. Willems in the following summary of the rules which are essential to be followed in carrying out this method:

Active mobilization should be begun without any delay and should be carried as far as the patient is in condition to do it. It should be done without interruption, even to the point of fatigue. This mobilization is not painful in the true sense of the word, it is only laborious. It is necessary to compel the patient to do it, to tease him if he is lacking in courage.

"It is never necessary to add passive movements to the active movements with the expectation of hastening the process.

"Patients treated by this method never present any serious alteration of their general condition, even during the early febrile period. They never look like those who have been severely infected. They do not fear movements as do those who are immobilized. Even in purulent arthritis it is striking to note that the joint has not the excessive sensibility which an infected joint presents when it is cared for by immobilization."—*Leo C. Donnelly, Detroit.*

EARLY SURGICAL AND ORTHOPAEDIC TREATMENT OF HEMIPLEGIA. By Jos. Byrne, M. D., M. R. C. S., Alfred S. Taylor, M. D., F. A. C. S., and Samuel W. Boorstein, M. D., New York. *Surg., Gyn. and Obst.*, Vol. XXIV, Oct., 1919, No. 4.

CONCLUSION AND SUMMARY.

1. Early operation within 2 to 4 weeks, or even after a much longer period, may be indicated in hemiplegia—

(a) Where the intracranial pressure threatens medullary strangulation, no matter what the site or nature of the lesions;

(b) In extradural haemorrhage with or without intradural haemorrhage or cerebral contusion, where cerebral compression threatens life or permanent dissability.

(c) In intradural haemorrhages of traumatic or spontaneous origin where cerebral compression threatens life or permanent disability.

(d) In intracerebral haemorrhage where focal compression threatens life or permanent disability.

2. A subtemporal decompression and evacuation of the clot is a simple procedure and should be used in every case of fresh hemiplegia where the above-mentioned indications are present.

3. If the patient be unconscious, an anaesthetic need not be used, as the shock of the operation is small.

4. Even in old cases of hemiplegia decompression is of benefit.

5. Decompressions should be used even in cases due to embolism or thrombosis.

6. The deformities and contractures of hemiplegia can be prevented.

7. Patients with hemiplegia should be put in the same category as anterior poliomyelitis and receive proper orthopaedic treatment from the beginning.

8. Plaster splints should be applied immediately to prevent contractures.

9. Massage and exercises are indicated and should be used intelligently.

10. Proper use of the limbs should be shown to the patients and encouraged.

11. In old and neglected cases deformities should be corrected and recurrences prevented.—*Leo. C. Donnelly, Detroit.*

CASES OF PRIMARY SUTURE. TEN CASES OF PRIMARY SUTURE OF THE JOINTS. LeFur, R., *Paris Chirurg.*, 1918, X, 400, 455. *Surg., Gyn. and Obst.*, October, 1919, No. 4.

From the results in this series, he draws the following conclusions:

1. In cases of joint wounds it is always more prudent and often necessary to open the articulation by a wide arthrotomy and to disinfect it thoroughly.

2. The disinfection and cleansing of the joint should be carefully done and complete. The arthrotomy should be large enough to expose the whole wound tract, the synovia, the cartilage and the bone regions, and to permit the removal of every particle of debris. The interior of the joint should be washed with ether.

3. Unless contra-indicated, the suture of the joint should be complete and a drain should not be used. The harm of drainage in joint wounds has been fully demonstrated. Drains favor infection and cause ankylosis. When drainage is necessary, the small Dakin drains should be used with continuous or interrupted irrigation with the Dakin fluid. These drains should be changed every day or every other day.—*Leo C. Donnelly, Detroit.*

BONE AND JOINT LESIONS OF YAWS WITH X-RAY FINDINGS IN TWENTY CASES. By Maj. Herman G. Maul, M. C., U. S. A. From the Laboratory and X-Ray Department Hospital, Manila, *The American Journal of Roentgenology.*

In the majority of cases the lesions show as rarefied areas, irregularly oval or elliptical in shape, with the long axis parallel to that of the bone in which the lesions are located. The size varies from the smallest descernible area to one that is 2 or 3 centimeters in length. The rarefication presents moderately well defined borders separating it from the unaffected bone and varies in translucency from the slightest differentiation of unnatural transparency to one stimulating a perforation. Most of the lesions appear to originate in the interior of the bone, while a number can be seen as small excavations on its outer surface. When the lesion is on the surface of the bone, the periosteum is usually destroyed, but occasionally the cortex shows thickening, and the periosteum is separated from the bone. In two cases of this series there is a general thinning of the cortex of the bone and a loss of the cancellous-tissue appearance. About 2% of the cases show a nodular type of lesion, evidenced by swelling over the surface of the bone, with a localized thickening of the cortex, which sooner or later in the course of the disease shows rarefacation in its center.

In the chronic lesions marked irregularity of the bony outline is evident, and the picture characteristic of the earlier lesions is more or less lost. The bone as a whole becomes deformed, and the growth of the bone is interfered with both in length and breadth. This dwarf-like picture is most frequently noticed in the cases showing the lesions in the epiphyses. Within the joints the destruction is most frequently seen on the parts of the articular surfaces most exposed to trauma, as oval or irregularly shaped excavations, making the

outline of the articular surface rough and uneven. It is concluded from this series of cases that the joint pains complained of are due in most part to the presence of the lesions of the articular surface.

With the exception of the 2% of cases showing as a swelling over the surface of the bone, the roentgen ray picture is different from the bone lesion of syphilis in that: (1) The periosteal proliferation is absent, and (2) the thickening of the cortex of the bone is absent. Also, in the 2% of cases where thickening of the cortex is present, the thickening remains localized, does not tend to extend along the whole length of the bone, and sooner or later shows rarefication in the center of the lesion.

The bone lesion of yaws may stimulate (1) tuberculous or septic central abscesses, (2) gumma, (3) hydatic cyst, (4) benign cyst, (5) fibrous osteitis, (6) enchondroma, (7) endothelioma, (8) secondary carcinoma, (9) myeloma, and (10) sarooma. The differential diagnosis can be made only by combining the radiographic appearances with all clinical data, including the history, physical signs, and evidence of disease or tumor in other parts of the body.—*Leo C. Donnelly.*